

Reviewing New Technologies, Trends and the Transport-Land Use System

A workshop funded by a Knowledge Synthesis Grant, supported by a partnership between Infrastructure Canada and the Social Sciences and Humanities Research Council.

Friday, November 12, 2021

1:30 - 4:00 a.m. via Zoom



UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING
Transportation Research Institute

Joining us today:

Canadian Urban Transit Association	Infrastructure Canada	TransLoc
City of Toronto	Metrolinx	TTC
City of Vancouver	Ministry of Transportation	University of Toronto
Durham Region Transit	Municipality of Durham Region	Waterfront BIA
Environics Analytics	Northcrest Developments	Waterfront Toronto
Ford of Canada	OCAD-U	York Region
GM	StrategyCorp	York Region Transit





An Integrated Approach to Transit System Evolution

Knowledge Synthesis Grants

Work Modules

- Module 1. Revisiting the Transportation-Land Use Connection
 - Revisit the **core theories and methodological frameworks** that inform the way we think about transportation and land use as an integrated system
- Module 2. Reviewing New Technologies, Trends and the Transport-Land Use System
 - Recent literature on **new transportation technologies and trends** with a particular focus on their implications for our understanding of the transportation-land use system
- Module 3. Reinterpreting Transport and Land Use for Future Integrated Systems Planning
 - Add value to the literature synthesis with a **reinterpretation of the transportation and land use connection**

Team

- PIs: Chris Higgins, Amer Shalaby, Eric Miller, Steven Farber, Khandker Nurul Habib
- Collaborators: Sara Diamond, Shauna Brail, Antonio Páez, Michael Widener
- RAs: Billy Zhang, Yixue Zhang

Project Module 2:

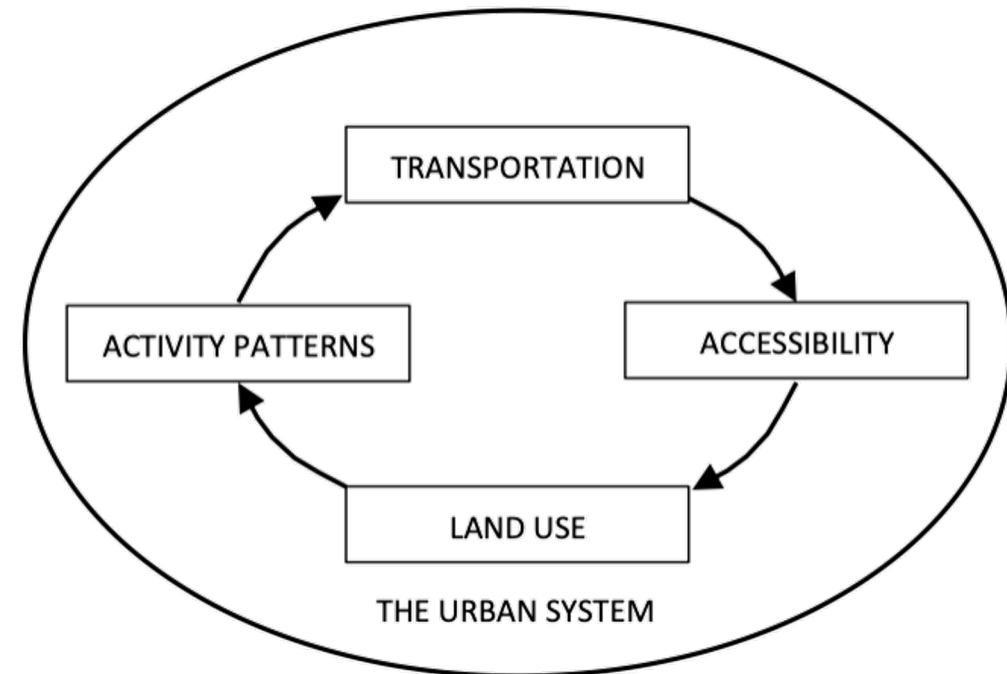
Reviewing New Technologies, Trends
and the Transport-Land Use System

1. Transport Technologies and the Transport-Land Use Connection

Looking *back*

Transportation Costs: The “Glue” of the City

- Transportation fundamentally intertwined with land use in cities
- Transport network facilitates travel between origins and destinations contained within different uses of land
- Urban forms and functions shaped by transportation costs and *accessibility*



Accessibility

- Accessibility is generally associated with a place (or places) of origin.
- Accessibility is a measure of **spatial interaction potential**



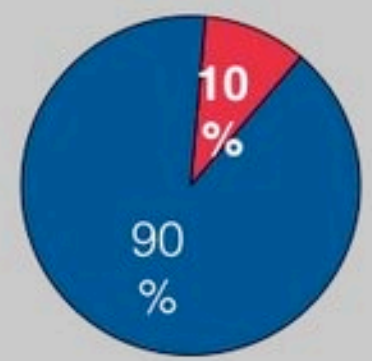


Transportation Costs: The “Glue” of the City

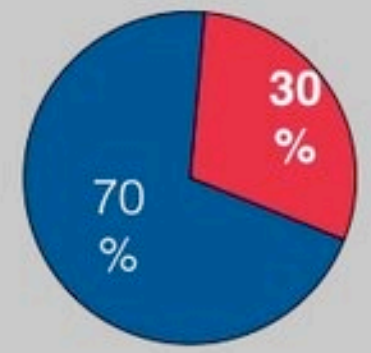
- Traditional monocentric cities: urban forms and functions when transportation costs were high
- Business functions agglomerate into CBD for economies of scale and network effects
 - Market, labour force access, knowledge spillovers
- Industry agglomerates around a port or rail terminal
 - Shipping bulk materials and heavy goods
- Walking and transit dominant modes for people movement
 - Households located within walking distance or around transit stops for access to CBD

Value Per Acre

Kansas City, MO

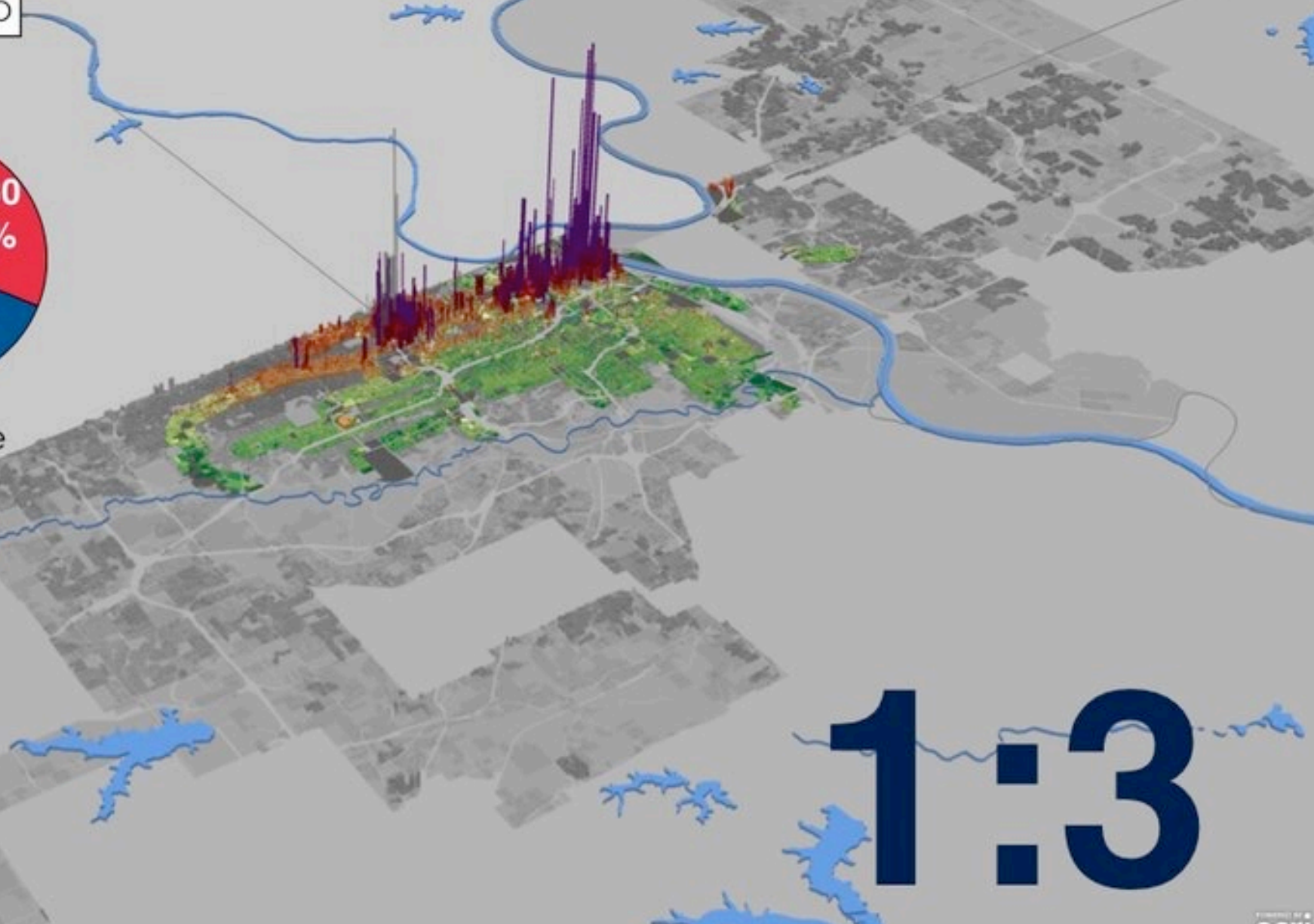


City Area



City Value

- Streetcar
- City



1:3





The Decline of Transportation Costs

- Transport costs before 1900 were enormously high: Roads and rail rare, people moved by foot and goods were carried by water
 - High densities in cities, both in land use and transport
 - Advantage for public transport
- Significant changes brought on by new transportation technologies: propel people and goods over long distances with better and better machines
 - Assume now that moving goods is essentially costless
 - Decentralization of people and jobs

The Decline of Transportation Costs(?)

- Cities have changed functions – exist to facilitate contact between people
- But moving *people* is not free –
 - Cars have simplified movement for many – car infrastructure essentially ubiquitous across North America
 - But remains a very large proportion of household transport costs
 - Congestion and delay also a big cost
- Information and Communication Technologies (ICTs) have long been theorized to bring about the “death of distance” or geography
 - Indeed, *information* or “codified knowledge” can be shared over long distances
 - But *tacit knowledge* defies easy transfer – requires face-to-face contact to share and experience to develop
- Consequence: Agglomeration effects have continued and people-moving costs have not really continued their decline in cities

Glaeser, E. L., & Kohlhase, J. E. (2004). Cities, regions and the decline of transport costs. In *fifty years of regional science*(pp. 197-228). Springer, Berlin, Heidelberg.

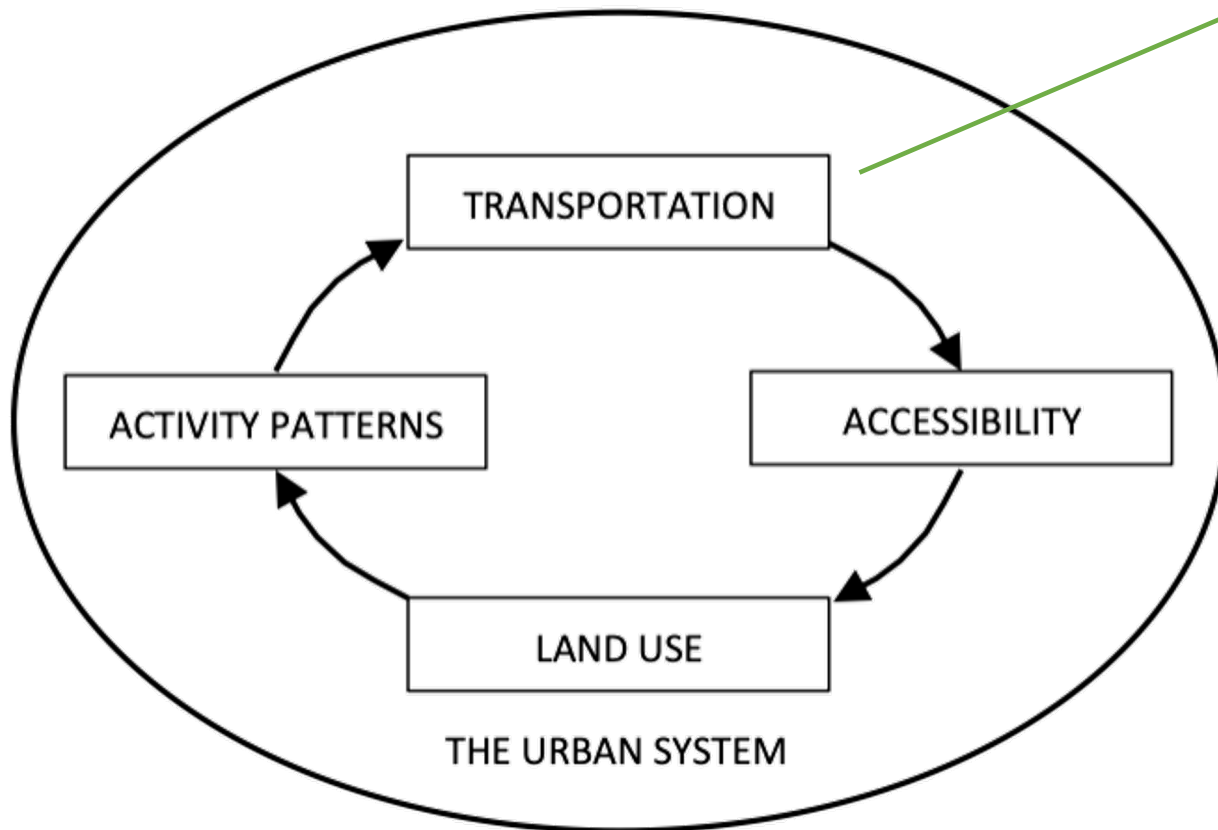
Gertler, M. S. (2003). Tacit knowledge and the economic geography of context, or the undefinable tacitness of being (there). *Journal of economic geography*. 3(1). 75-99.

2. New Transport Technologies

Looking *ahead*

New Transportation Technologies

- MaaS
- Mobility on-demand
- Flexible transportation systems
- Flexible mobility on-demand
- Mobility services
- Automated Vehicles
- Electric Vehicles
- Carsharing
- Bikesharing
- Ridehailing
- Demand-responsive transit
- Ridesharing
- Ridesplitting
- Ridesourcing
- Carpooling
- Microtransit
- Paratransit



Physical Modes

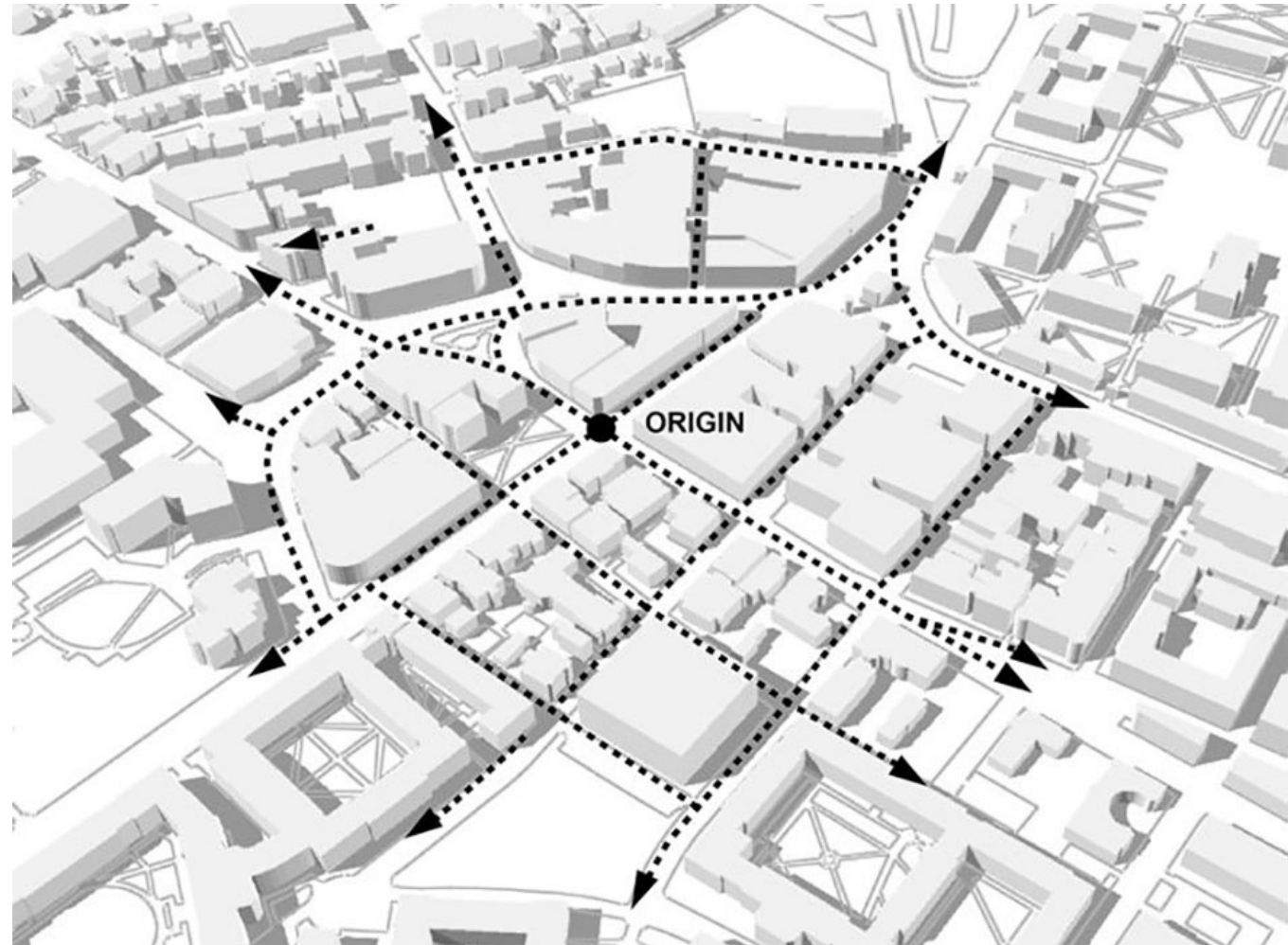
Physical Network

Mobility Services

Mobility *as a Service*

Physical Network (and Land Uses)

- Physical Network
 - The physical infrastructure
- Land uses
 - Containing the origins/destinations and activities



Physical Modes

- Combination of vehicle, infrastructure, and control system technologies for moving people and/or goods
 - Road-based, rail transit, active transport modes
 - Sub-modes like EVs and AVs
- Modes is arguably too restrictive a concept – reduce to *means of transport*
 - Transportation technologies in the past associated with decline in transportation costs
 - A “push” factor for decentralization

(Potentially?) Disruptive Technologies

- EVs
 - Reduce operational costs and environmental externalities
 - Can entail constraints in mobility systems, e.g. charging and range
 - Also enable new micromobility technologies, e.g. e-bikes, scooters
- C/AVs
 - Can challenge conventional modes of automobile ownership
 - But does not bring a shift away from automobile dependency
 - Can reduce operational costs
 - Can achieve MaaS objectives by increasing convenience and facilitating multimodal trips

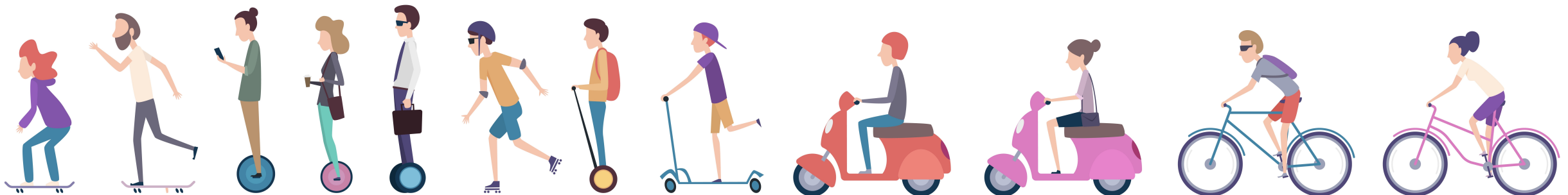
(Potentially?) Disruptive Technologies

- Micromobility Mode

- E-scooters
- Electric bicycles
- ...

- Strong potential for being competitive with cars for trips if integrated with public transit as a single trip chain

- Oeschger, G., Carroll, P., & Caulfield, B. (2020). Micromobility and public transport integration: The current state of knowledge. *Transportation Research Part D: Transport and Environment*, 89, 102628.





Mobility Service

- An operational entity – provides the means by which trip-makers contract for a service that enables the requested trip
 - Using one or several modes
 - External
 - Public transit, taxis examples of conventional mobility services
 - (although we commonly treat them as modes)
 - Ride-hailing, bike-sharing, micromobility services
 - Demand-responsive transit
 - Smaller vehicles than regular transit vehicles, typically minibuses, or jitneys, to serve somewhat randomly occurring trip requests for short time periods
 - Personal or self-supplied
 - Household car, riding own bicycle, walking

Mobility *as a Service*

- Purchase *mobility* – rides or trips rather than vehicles
- Functionally: payment integration for seamless choice, mobility packages with alternatives, and ICT back-end facilitating real-time information
 - User-centric, personalization of mobility services
 - Optimize multimodal trips, ideally with transit as core service
 - Switch from ownership-based to accessibility-based transportation system
 - Fully implemented: centralized platform coordinates all mobility alternatives, both external and personal
- Potential for increasing sustainability through emphasis on integrated and shared systems, demand-responsive services, dynamically-priced services to manage demand
 - Can offer first/last-mile solution to feed higher-order transit
 - Can increase accessibility by filling spatio-temporal gaps in service coverage

Mobility *as a Service*

- But currently not all-encompassing – many mobility services operate independently and outside of a MaaS setting
- Levels:
 - 0: single mobility service
 - 1: integrates route and mode options, but does not offer booking or payment options (e.g. Google Maps)
 - 2: integrated routing, booking, and payment options for various modes
 - 3-4: subscriptions, policy control

2. COVID-19

Transportation Costs

- Helpful to think also of transportation costs in the flows of information and knowledge
- Fax machines, email... the *death of distance* had not yet been realized
- However, COVID-19 has brought on
 - Work-from-home policies
 - Zoom, Teams, etc. as *new transportation technologies*



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Economic and Social Reports

Working from home after the COVID-19 pandemic: An estimate of worker preferences

by [Tahsin Mehdi](#) and [René Morissette](#)

Release date: May 26, 2021

[More information](#)

[PDF version](#)

DOI: <https://doi.org/10.25318/36280001202100500001-eng>

As is now well known, the COVID-19 pandemic substantially increased work from home in Canada and many industrialized countries. In January 2021, 32% of Canadian employees aged 15 to 69 worked most of their hours from home, compared with 4% in 2016 (Mehdi and Morissette 2021).

February 2021 Labour Force Survey

- WFH not evenly distributed over population characteristics.

	Both sexes	Men	Women	Education			Age group		
				High school or less	Some post-secondary	Bachelor's degree or higher	15 to 34	35 to 54	55 to 64
percent									
2016	4.1	3.9	4.2	1.7	3.7	6.8	2.9	4.4	5.4
2018	4.9	4.4	5.5	2.2	5.0	7.8	3.6	5.5	5.9
Apr. 2020	42.6	36.3	50.3	16.4	35.7	66.6	41.8	45.2	36.4
...									
Feb. 2021	31.3	28.6	34.7	11.0	25.1	52.8	31.1	33.6	25.8



Statistics Canada

Statistique Canada

February 2021 Labour Force Survey

- New teleworkers – usually worked outside the home prior to COVID-19
 - 80% of these new teleworkers would like to work *at least half of their hours from home once the pandemic is over*. Of this 80%:
 - 41% would prefer working about *half of their hours at home* and the other half outside the home, while
 - 39% would prefer working *most* (24%) or *all* (15%) of their hours at home.
 - The remaining 20% would prefer working most (11%) or all (9%) of their hours *outside the home*.

Nearly 1 in 3 Ontario home buyers say COVID-19 concerns have altered preferences: report

YEJI JESSE LEE >

TORONTO

PUBLISHED AUGUST 20, 2020

This article was published more than 1 year ago. Some



TD Economics



The Rise of the 'Burbs

Johary Razafindratsita, Economist | 416-930-7126

November 3, 2020

Highlights

- The COVID-19 pandemic has created a shift in housing preferences toward bigger homes in the suburbs. The rental market bears some of the most compelling evidence of this shift as vacancy rates have risen and rents plummeted in downtown cores.
- Similarly, existing home sales have consistently defied expectations, driven by the growing ranks of millennial households taking advantage of low mortgage rates. These households are behind the demand for bigger homes and more outdoor space.
- The race for space is also borne out in homebuilding trends, which have increasingly focused on bigger homes in lower density areas. Single-family construction, particularly in small metro suburbs, has powered the rebound, while starts in the multi-family segment are still below pre-pandemic levels.

Setting the Stage



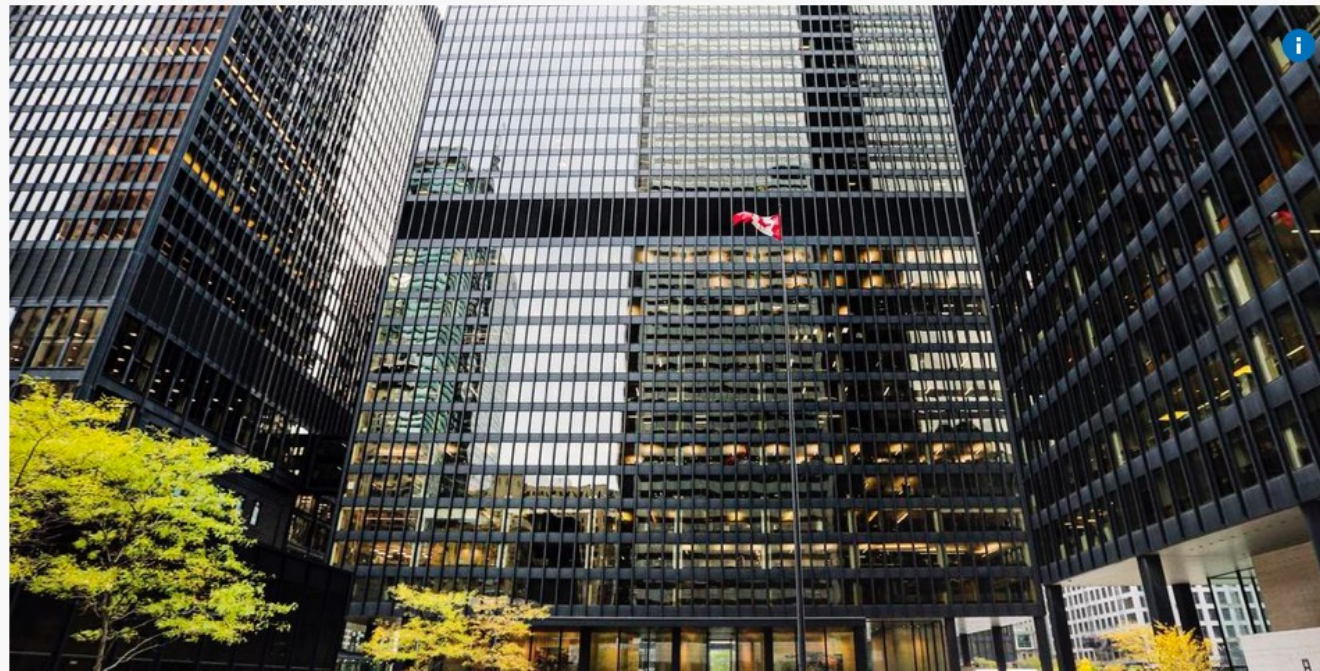
THE COMEBACK

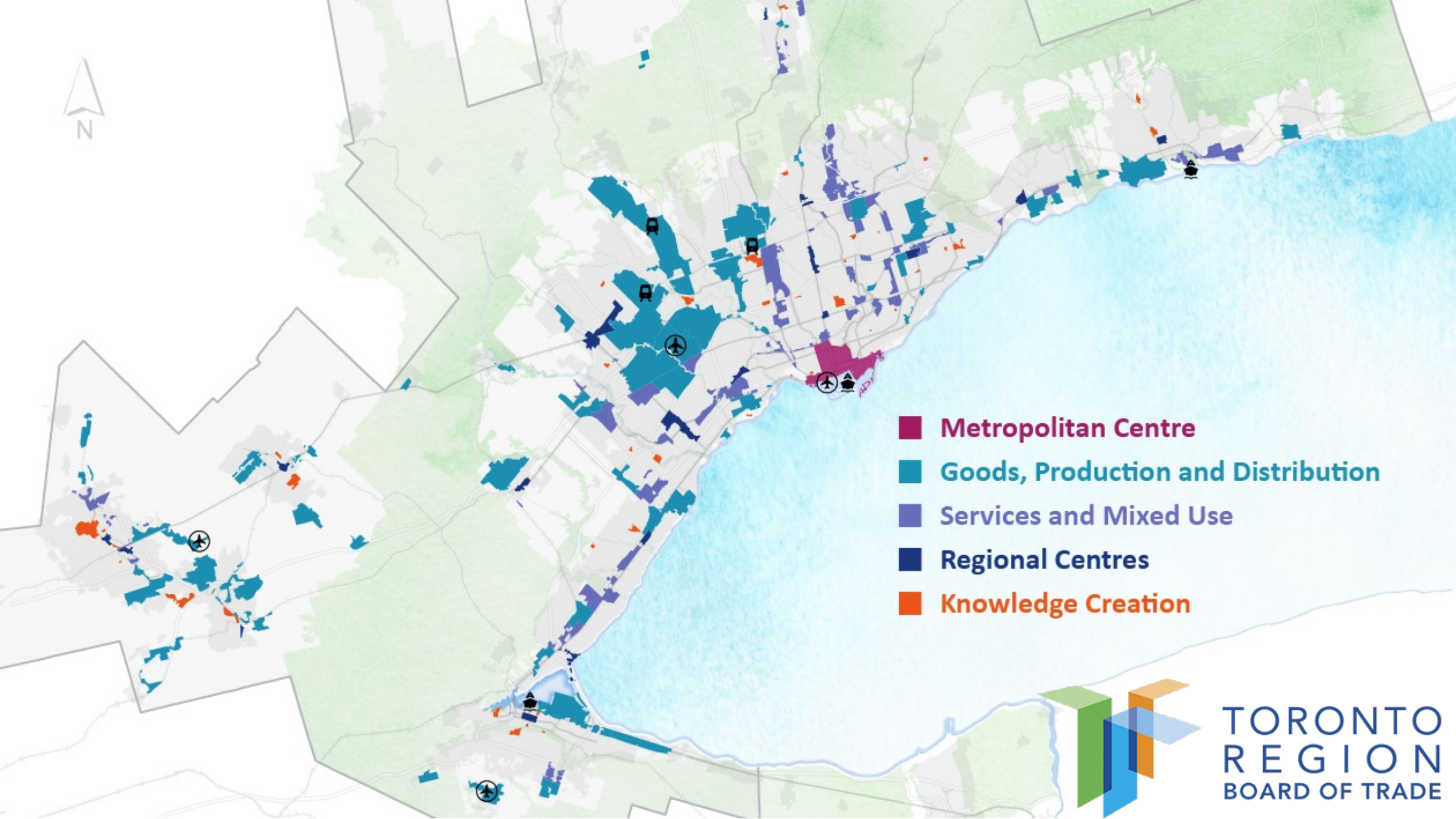
New data shows number of workers in financial district is still down by 77 per cent – and experts say it may never recover

By **Rosa Saba** Business Reporter

Wed., Nov. 10, 2021 | 3 min. read

JOIN THE CONVERSATION (15)





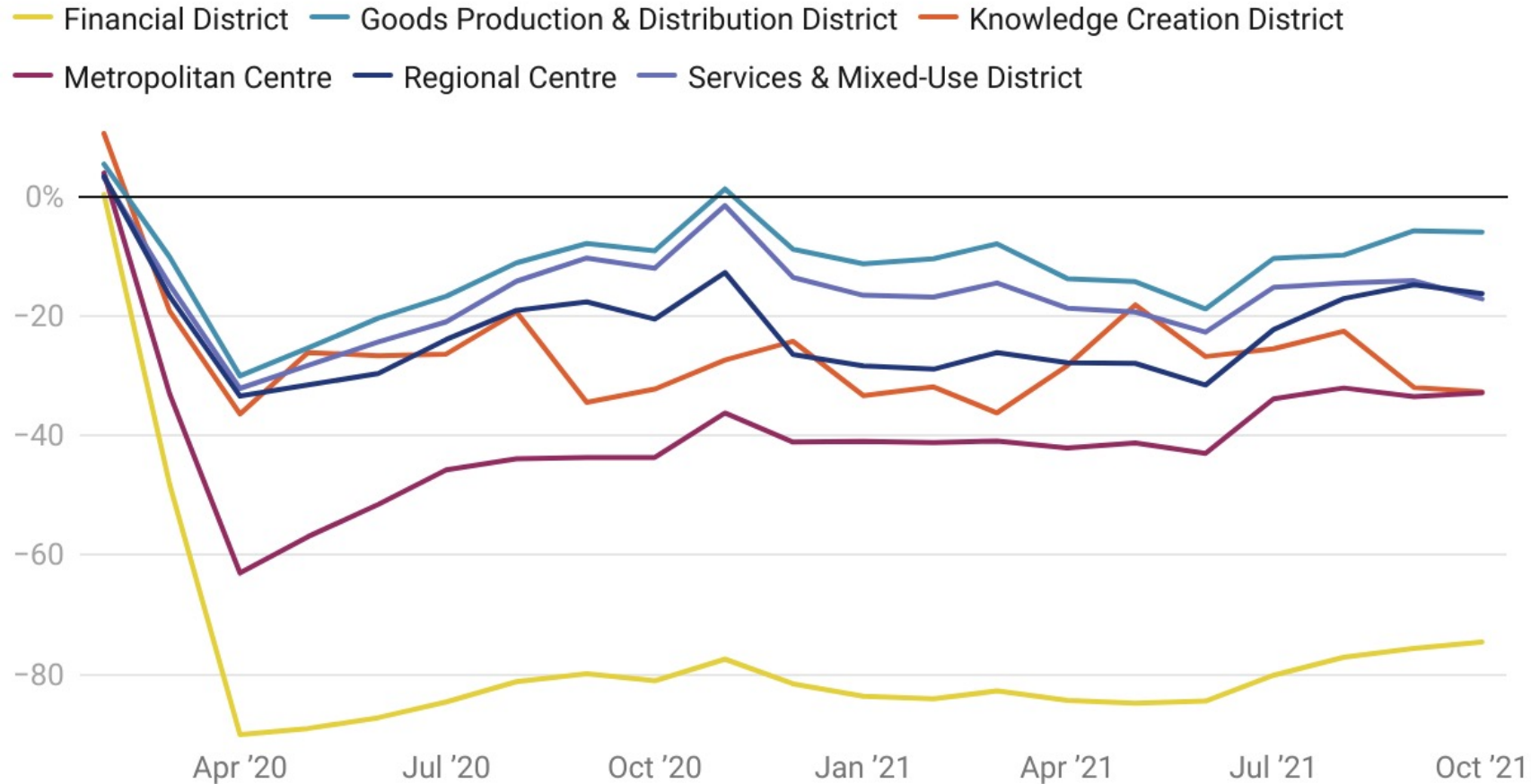
- Metropolitan Centre**
- Goods, Production and Distribution**
- Services and Mixed Use**
- Regional Centres**
- Knowledge Creation**



**TORONTO
REGION
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Weekday Visitors Volume (% Change from 2019)

Average weekday visitors volume by destination. % change from same month in 2019. Innovation Corridor. Feb 2020 - Oct 2021



The analysis excludes residents and workers in the area analysed. Visitors were only counted if they spent a minimum of 30 minutes in the area. All data used by TELUS Insights is fully de-identified, meaning it cannot be traced back to an individual. It is also aggregated into large data pools; ensuring privacy is fully protected at all times. The TELUS Insights platform uses privacy protective methodologies and has achieved Privacy by Design Certification.

Source: Telus Insights • Created with Datawrapper



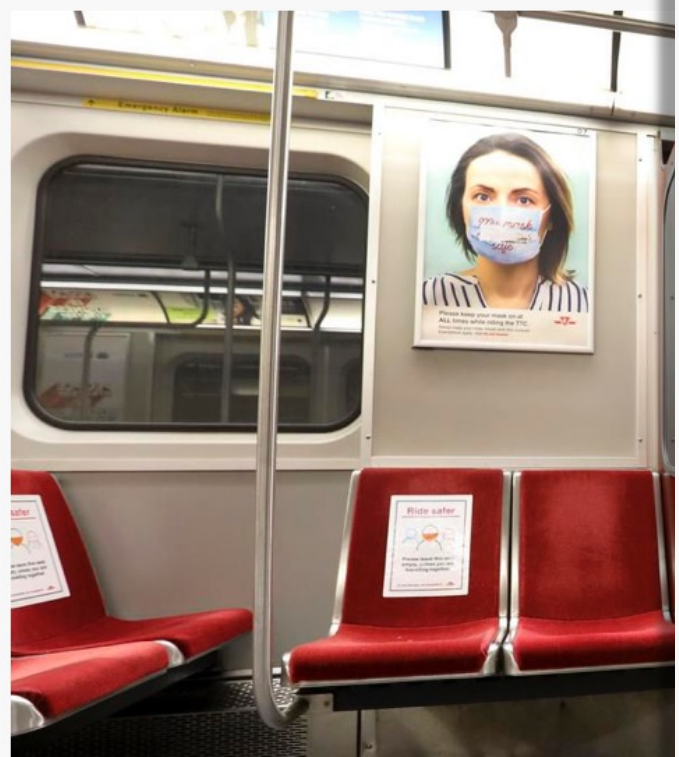
**TORONTO
REGION
BOARD OF TRADE**

GTA

"Transit death spiral": Experts warn that post-pandemic recovery may be led by cars

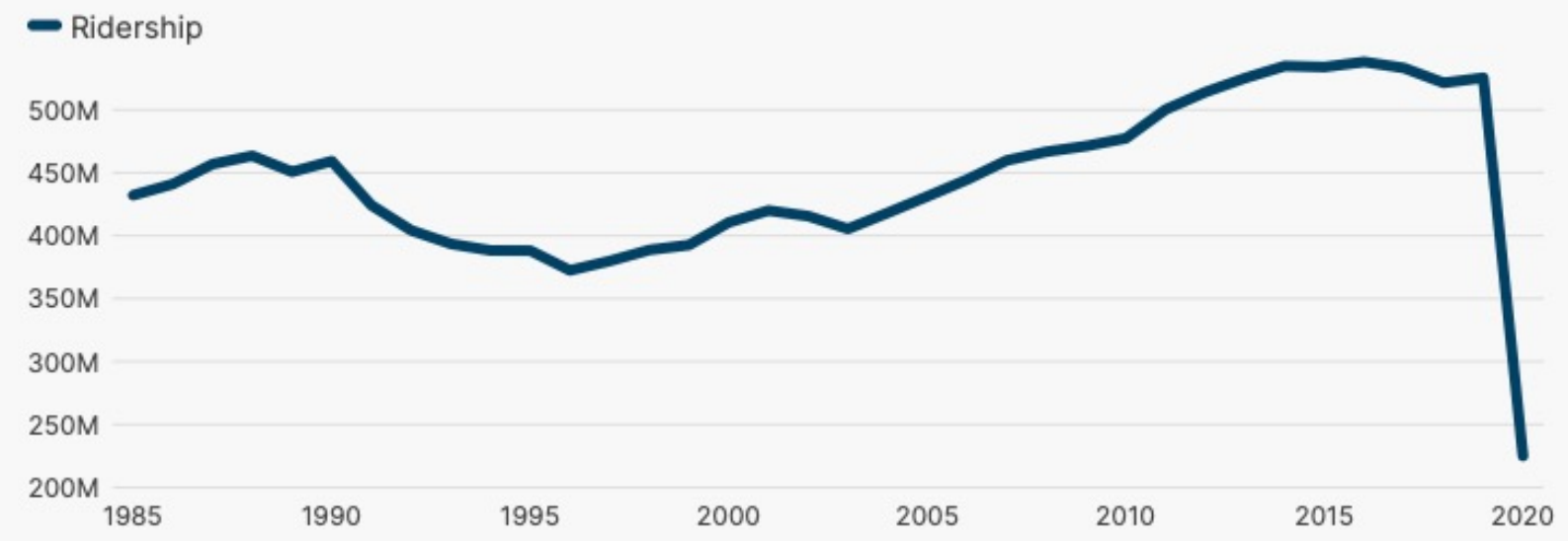
By **Ben Spurr** Transportation Reporter
Wed., Oct. 6, 2021 | 7 min. read

JOIN THE CONVERSATION (48)



Annual TTC ridership

After years of growth, the TTC is facing a worse ridership crunch than the sustained slump it experienced during the 1990s recession.



SOURCE: TORONTO TRANSIT COMMISSION

TORONTO STAR



BUSINESS

'The traffic jams were... billionaire Frank Str... his tiny electric car 'S... Toronto



By **Jacob Lorinc** Business Reporter
Thu., Sept. 16, 2021 | 3 min. read

Article was updated Sep. 17, 2021



LOCAL : NEWS

Toronto's 1st automated transit vehicle to start 5-month test run on Scarborough route



By **Mike Adler** Toronto.com

Thu., Sept. 16, 2021 | 2 min. read

Set Scarborough as My Local news



Toronto bans electric scooters over safety concerns and not everyone is pleased



Transit and New Mobility Services

- Evidence in Toronto that ~30% of ridehailing trips have transit alternatives of similar duration
 - But 27% of trips would take at least 30 minutes longer by transit
 - Recommend imposing an additional tax upon ride-hailing trips with transit alternatives of similar duration
- E-scooters in DC
 - When choosing e-scooters over transit, travelers pay a price premium but save some travel time
 - E-scooters enhance mobility services for some underserved neighborhoods
 - Before COVID-19, about 10% of all e-scooter trips were taken to connect with the Metrorail system

Young, M., Allen, J., & Farber, S. (2020). Measuring when Uber behaves as a substitute or supplement to transit: An examination of travel-time differences in Toronto. *Journal of Transport Geography*, 82, 102629.

Yan, X., Yang, W., Zhang, X., Xu, Y., Bejleri, I., & Zhao, X. (2021). A spatiotemporal analysis of e-scooters' relationships with transit and station-based bikeshare. *Transportation Research Part D: Transport and Environment*, 101, 103088.

[Real Estate](#) / [FP Work](#)

What the flattening bid-rent curve means for the future of downtown real estate

Consumer preferences and WFH technologies will play increasing roles in determining the future desirability of a location

Murtaza Haider and Stephen Moranis, Special to Financial Post

Jun 11, 2021 • June 11, 2021 • 3 minute read • [Join the conversation](#)



NEWS RELEASE

Building Ontario with Highway 413

New 400 series highway will relieve gridlock, create jobs, improve movement of goods, and save drivers commuting time

November 10, 2021
[Office of the Premier](#)





SCIENCE |
CORONAVIRUS COVERAGE

'Zoom fatigue' is taxing the brain. Here's why that happens.

Video calls seemed an elegant solution to remote work, but they wear on the psyche in complicated ways.

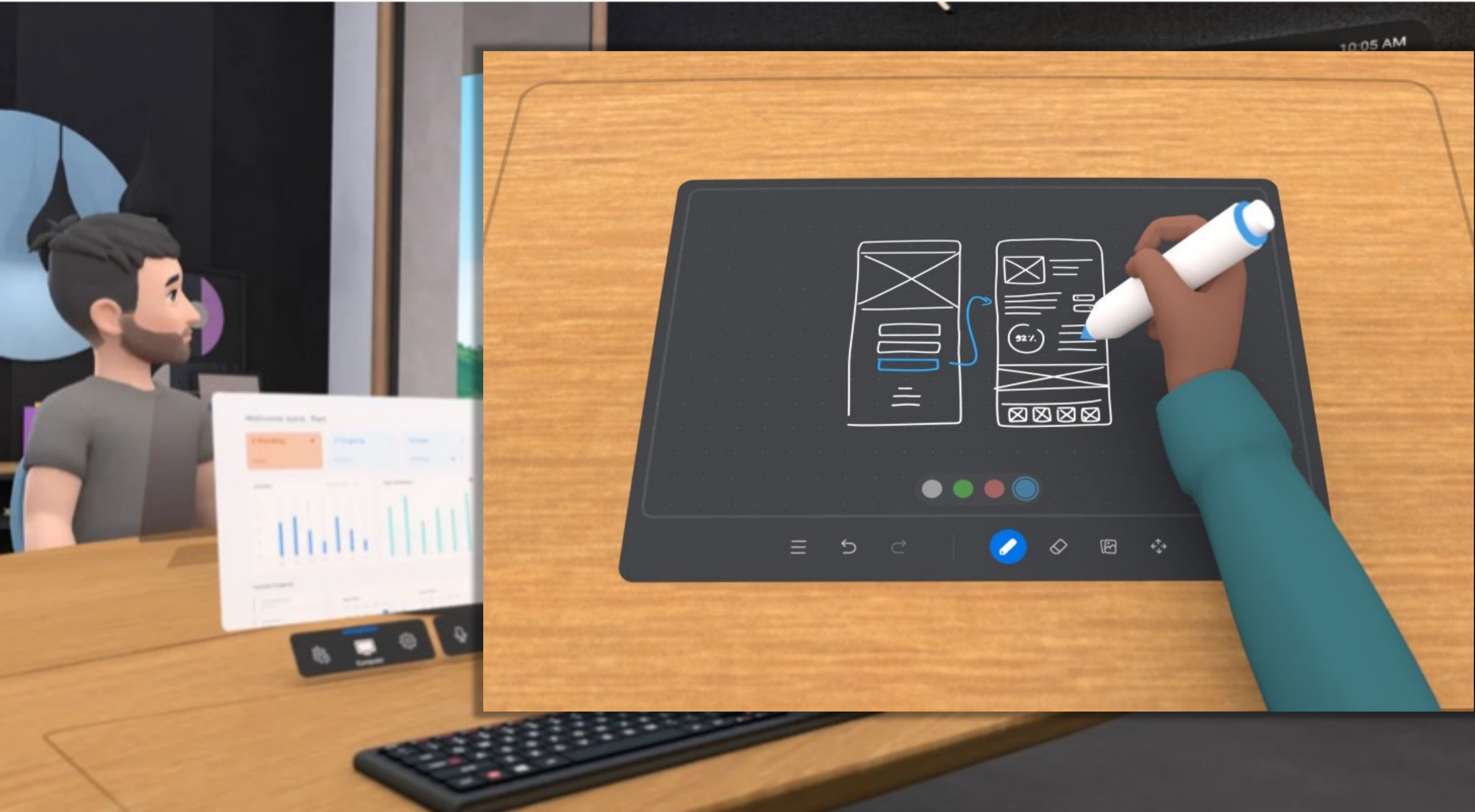


Image from Facebook via <https://www.wired.com/story/facebook-horizon-workrooms-metaverse/>



00:02:45



Leave



01 / Chapter

Creating Boundaryless Opportunities

Helping people achieve their aspirations

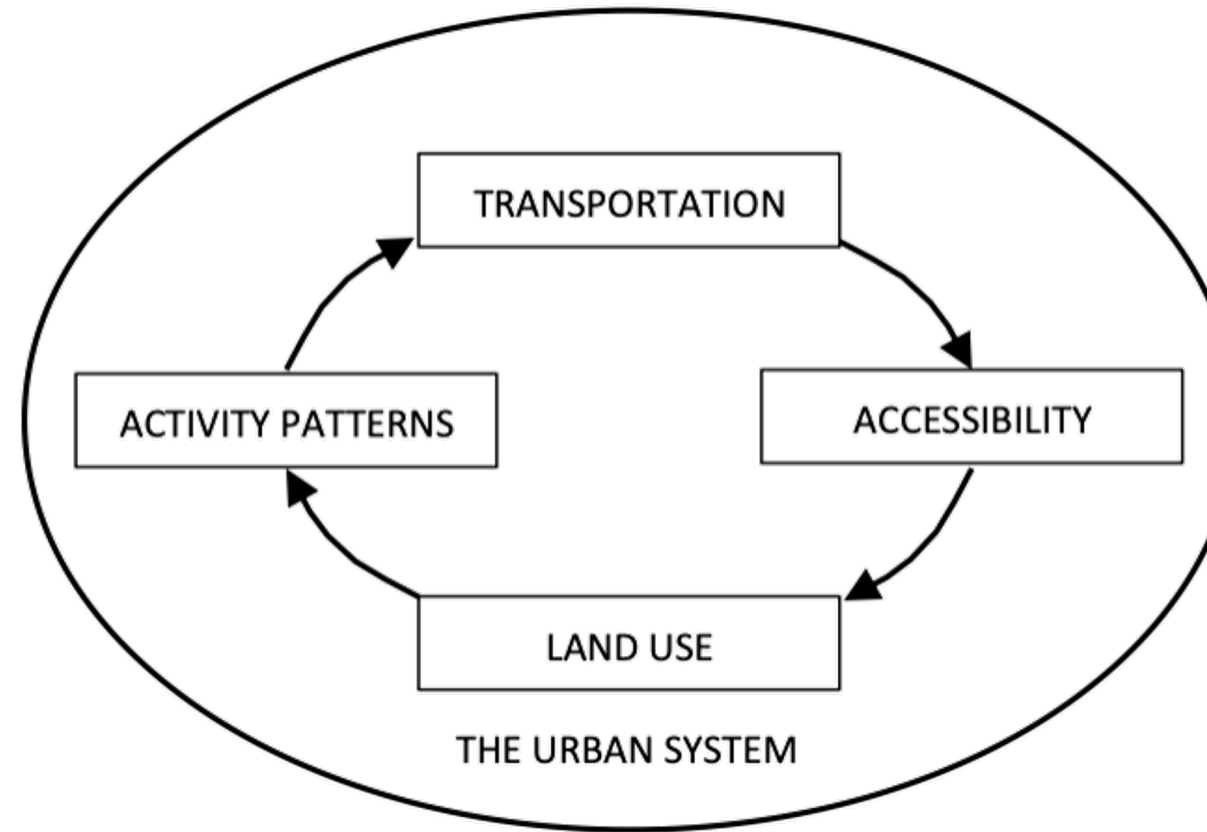
FY 2021 Presentation

Microsoft Edge

39°

Sustainability Planning

- Need to eliminate carbon emissions
- Focused on transportation-side solutions
 - But what about the land use side?
 - 15-min cities, living locally
- Social equity and justice in mobility and accessibility



Breakout Discussion

Discussion Questions

- **Table 1:** Are we close to realizing an integrated MaaS platform? How will MaaS change the way we utilize different mobility services, including traditional (e.g. transit, taxi) and self-supplied (walk, own bike or car)?
- **Table 2:** Which new mobility technologies will be the most impactful on the transportation-land use connection? Will they lead to more, or less suburbanization?
- **Table 3:** How much of the COVID-19 related changes in workplace practices, locational preferences, and travel behaviour will be permanent?
- **Table 4:** Do we need to rethink planning for sustainability (e.g. through transit and TOD) in the post-COVID and new mobility context? What should the role of government and planning be?

Breakout Room Assignments

Round 1

Abram - 1	Conor - 1	Kevin Y - 4	Ryan - 1
Adrian - 2	Daniel - 1	Marlene - 2	Saeed - 4
Alex - 2	Elaine - 3	Matt - 3	Sara - 3
Amer - 3	Eric - 2	Mckenzie - 4	Sierra - 4
Andy - 1	Gregory - 3	Michael Wo - 1	Spencer - 3
Billy - 2	Habib - 4	Michel - 2	Ted - 3
Cail - 2	Hamish - 2	Mike Wi - 1	Tim - 4
Calvin - 4	Herman - 2	Nick - 4	Trajce - 4
Chris H - 1	Jackson - 2	Raphael - 4	Tyler - 3
Christopher N - 1	Kevin C - 3	Robert - 1	

Breakout Room Assignments Round 2

Abram - 3	Conor - 2	Kevin Y - 1	Ryan - 2
Adrian - 3	Daniel - 2	Marlene - 1	Saeed - 4
Alex - 1	Elaine - 1	Matt - 4	Sara - 4
Amer - 3	Eric - 2	Mckenzie - 3	Sierra - 3
Andy - 2	Gregory - 4	Michael Wo - 2	Spencer - 3
Billy - 2	Habib - 4	Michel - 4	Ted - 2
Cail - 3	Hamish - 1	Mike Wi - 4	Tim - 1
Calvin - 2	Herman - 1	Nick - 3	Trajce - 3
Chris H - 1	Jackson - 1	Raphael - 3	Tyler - 4
Christopher N - 2	Kevin C - 4	Robert - 1	

Breakout Room Assignments

Round 3

Abram - 4	Conor - 3	Kevin Y - 2	Ryan - 3
Adrian - 4	Daniel - 4	Marlene - 4	Saeed - 4
Alex - 4	Elaine - 2	Matt - 1	Sara - 2
Amer - 3	Eric - 2	Mckenzie - 2	Sierra - 1
Andy - 3	Gregory - 1	Michael Wo - 4	Spencer - 3
Billy - 2	Habib - 4	Michel - 1	Ted - 1
Cail - 4	Hamish - 3	Mike Wi - 3	Tim - 2
Calvin - 3	Herman - 4	Nick - 2	Trajce - 2
Chris H - 1	Jackson - 3	Raphael - 1	Tyler - 1
Christopher N - 3	Kevin C - 2	Robert - 1	

Table 1

Are we close to realizing an integrated MaaS platform? How will MaaS change the way we utilize different mobility services, including traditional (e.g. transit, taxi) and self-supplied (walk, own bike or car)?

Reviewing New Technologies, Trends and the Transport-Land Use System

Table 2

Which new mobility technologies will be the most impactful on the transportation-land use connection?
Will they lead to more, or less suburbanization?



Table 3

How much of the COVID-19 related changes in workplace practices, locational preferences, and travel behaviour will be permanent?



Table 4

Do we need to rethink planning for sustainability (e.g. through transit and TOD) in the post-COVID and new mobility context? What should the role of government and planning be?



Wrap Up

- Thank you!
- Transport-land use research is the foundation of what we do here at the University
 - SSHRC and Infrastructure Canada (INFC) have launched this Knowledge Synthesis Grants (KSG) competition to mobilize social sciences and humanities research to examine and synthesize existing knowledge on mobility and public transit issues
 - But bridging theory and practice is fundamental for the success of this project
- Further workshop planned for Modules 3 (Reinterpreting transport-land use for integrated systems planning) – **December 3**
- And get in touch – cd.higgins@utoronto.ca

Reviewing New Technologies, Trends and the Transport-Land Use System

A workshop funded by a Knowledge Synthesis Grant, supported by a partnership between Infrastructure Canada and the Social Sciences and Humanities Research Council.

Friday, November 12, 2021

1:30 - 4:00 a.m. via Zoom



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